



**1996 Automotive Technology Development  
Customers' Coordination Meeting**



**ENGINE RESEARCH**

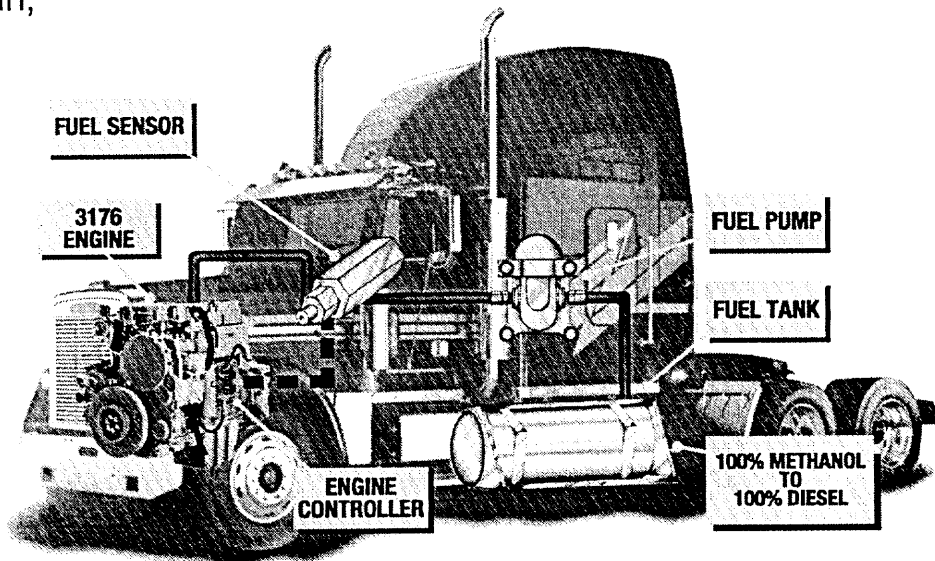
# **Development of a Heavy-Duty Flexible Fuel (Diesel-Methanol) Engine**

## **Subcontractor**

Caterpillar, Inc.

## **Principal Investigators**

R.L. Miller, A.K. Chan,  
& D.W. Berglund  
Caterpillar, Inc.  
P.O. Box 1875  
Peoria, IL 61656  
(309) 578-2251



## **FLEXIBLE FUEL CONCEPT**

## **Objective:**

Develop a heavy-duty diesel cycle flexible fuel (diesel-methanol) engine capable of meeting the following performance goals:

- ▶ Methanol and Diesel Power Density = Conventional Diesel
- ▶ Methanol and Diesel Thermal Efficiency = Conventional Diesel
- ▶ Meet 1991 EPA Emissions on Diesel
- ▶ Meet 1998 EPA Emissions on Methanol

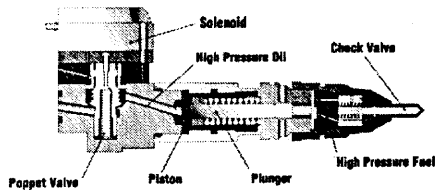


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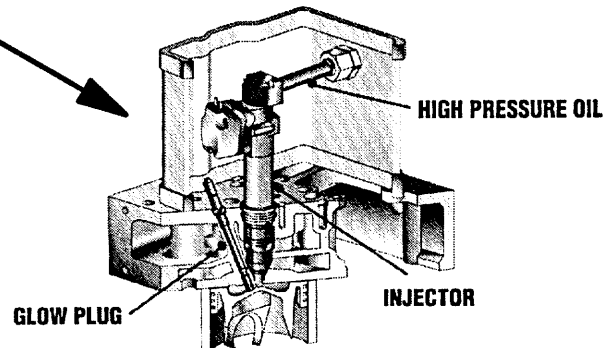


ENGINE RESEARCH

**3171 Flexible Fuel Injector**



**3171 FLEX FUEL ENGINE**



## Approach

- Develop common flexible fuel injection/combustion system
- Design/build single cylinder version of a prototype heavy-duty flexible fuel engine
- Develop sensor to identify fuel mixture
- Demonstrate engine performance on both fuels

## Accomplishments

	Conventional 3171 Diesel	Flexible Fuel 3171	Flexible Fuel 171
Fuel Type	100% Diesel	100% Diesel	100% Methanol
Power (kW/L)	25.3	25.3	25.3
Thermal Effic.	42%	42%	42%
NOx (g/hp-hr)	4.42	4.39	3.85
HC (g/hp-hr)	0.20	0.22	9.2
Part. (g/hp-hr)	0.09	0.12	0.05

## Future Direction

- Develop multi-cylinder flex-fuel engine
- Focus medium duty market (250 hp)
- Meet 1998 EPA emission standards

